

CLAIMS

1. (Currently Amended) An apparatus for phase and frequency locking, comprising:  
  
a voltage controlled Phased Locked Loop (PLL), wherein the PLL is at least configured to have a Low Pass Filter (LPF) and a Voltage Controlled Oscillator coupled at a first node; and  
  
a charge leakage correction circuit ~~at least~~ coupled to the first node ~~[[.]]~~ that is at least configured to:

measure a first voltage across the LPF at lock;

measure a second voltage across the LPF periodically after lock;

add charge to the LPF if the rate of change of voltage across the LPF is negative; and

subtract charge from the LPF if the rate of change is positive.

2. (Currently Amended) The apparatus of Claim 1 ~~[[2]]~~, wherein the charge leakage correction circuit further comprises:

a charge pump, wherein the charge pump is at least configured to add charge to the LPF and wherein the charge pump is at least configured to subtract voltage from the LPF; and

a differentiator, wherein the differentiator is at least coupled to the charge pump and wherein the differentiator is at least configured to measure the rate of change of the voltage across the LPF.

3. (Currently Amended) An apparatus for phase and frequency locking, comprising:  
  
a voltage controlled Phased Locked Loop (PLL), wherein the PLL is at least configured to have a Low Pass Filter (LPF) and a Voltage Controlled Oscillator coupled at a first node; and

a charge leakage correction circuit at least coupled to the first node, wherein the charge leakage correction circuit further comprises:

a differentiator, wherein the differentiator is at least coupled to a charge pump and the first node, and wherein the differentiator is at least configured to measure the rate of change of the voltage across the LPF by measuring a first voltage at lock and a second voltage periodically after lock;

[[a]] the charge pump, wherein the charge pump is at least configured to add charge to the LPF if the rate of change is negative, and wherein the charge pump is at least configured to subtract charge voltage from the LPF if the rate of change is positive. ; and

~~a differentiator, wherein the differentiator is at least coupled to the charge pump and is at least configured to be coupled to the first node, and wherein the differentiator is at least configured to measure the rate of change of the voltage across the LPF.~~

4. (Original) The apparatus of Claim 3, wherein the charge pump further comprises:  
a plurality of switches at least configured to be coupled to the first node;  
a positive current source coupled to at least one first switch of a plurality of switches; and  
a negative current source coupled to at least one second switch of a plurality of switches.

5. (Currently Amended) An ~~The~~ apparatus for correcting charge leakage across an LPF coupled to a first node, comprising:

a differentiator coupled to a charge pump and the first node, wherein the differentiator is at least configured to measure the rate of change of the voltage across the LPF by measuring a first voltage at lock and a second voltage periodically after lock;

[[a]] the charge pump coupled to the first node, wherein the charge pump is at least configured to add charge to the LPF if the rate of change is negative, and wherein the charge pump is at least configured to subtract charge voltage from the LPF if the rate of change is positive; ~~and a differentiator, wherein the differentiator is at least coupled to the charge pump and is at least configured to be coupled to the first node, and wherein the differentiator is at least configured to measure the rate of change of the voltage across the LPF.~~

6. (Currently Amended) A method for correcting charge in a PLL having an LPF, comprising:

locking a phase and a frequency;

measuring the rate of change for voltage across the LPF by measuring a first voltage at lock and a second voltage periodically after lock;

if the rate of change of voltage across the LPF is positive, removing charge from the LPF;  
and

if the rate of change of voltage across the LPF is negative, adding charge to the LPF.

7. (Currently Amended) A method for correcting charge in a PLL having an LPF, comprising:

locking a phase and a frequency;

measuring the voltage across the LPF at lock to obtain a first measured voltage;

measuring the voltage across the LPF periodically after lock to obtain a second measured voltage;

if difference between the second measured voltage and the first measured voltage is positive,  
removing charge from the LPF;

if difference between the second measured voltage and the first measured voltage is negative  
~~positive~~, adding charge to the LPF.

8. (Currently Amended) A computer program product for correcting charge in a PLL having an LPF, the computer program having a medium with a computer program embodied thereon, the computer program comprising:

computer program code for locking a phase and a frequency;

computer program code for measuring the rate of change for voltage across the LPF by measuring a first voltage at lock and a second voltage periodically after lock;

if the rate of change of voltage across the LPF is positive, computer program code for removing charge from the LPF; and

if the rate of change of voltage across the LPF is negative, computer program code for adding charge to the LPF.

9. (Currently Amended) A computer program product for correcting charge in a PLL having an LPF, the computer program having a medium with a computer program embodied thereon, the computer program comprising:

computer program code for locking a phase and a frequency;

computer program code for measuring the voltage across the LPF at lock to obtain a first measured voltage;

computer program code for measuring the voltage across the LPF periodically after lock to obtain a second measured voltage;

if difference between the second measured voltage and the first measured voltage is positive, computer program code for removing charge from the LPF;

if difference between the second measured voltage and the first measured voltage is negative ~~positive~~, computer program code for adding charge to the LPF.

10. (New) The apparatus of Claim 1, wherein the apparatus is a processor.
11. (New) The apparatus of Claim 1, wherein the apparatus is a computer.
12. (New) The apparatus of Claim 3, wherein the apparatus is a processor.
13. (New) The apparatus of Claim 3, wherein the apparatus is a computer.
14. (New) The apparatus of Claim 5, wherein the apparatus is a processor.
15. (New) The apparatus of Claim 5, wherein the apparatus is a computer.
16. (New) The method of Claim 6, wherein the method is practiced by a computer system having at least one processor.

17. (New) The method of Claim 7, wherein the method is practiced by a computer system having at least one processor.